ANTARCTIC REBOUND AND THE TIME-DEPENDENCE OF THE EARTH'S SHAPE

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Great strides have been made during the past 30 years in refining models of the last global glaciation. The refinements draw upon a vastly expanded relative sea level and sedimentary core record. Furthermore, we now possess a sharpened understanding of the mechanisms that drive climate changes associated with deglaciation. Some 15 years ago, using only 5.5 years of ranging data, analyses of the drift in LAGEOS I node acceleration was used to infer that postglacial rebound was responsible for a secular change in the Earth's ellipsoidal shape [Yoder et al., 1983]. Today there exists a wealth of geodynamics satellite orbit data that constrain the secular time-dependence of the Earth's shape and low order gravity field, which includes mass redistribution from present-day glacier and great ice sheet imbalance and from postglacial rebound. We have shown that an unambiguous determination of the secular variation in the Earth's pear shaped harmonic ($l = 3$, $m = 0$) might provide information that bears on the present-day mass balance of Antarctica. This issue is revisited in light of new constraints on glacial loading during the late-Pleistocene and Holocene. An especially critical issue for the interpretation of secular odd degree zonal harmonics, $l = 3$ to 7, is the timing and magnitude of the deglaciation of Antarctica from Last Glacial Maximum. We explore ways in which the recovery of secular variation in both zonal and non-zonal harmonics for $l = 2$ through 7 can improve constraints on both rebound and present-day ice sheet balance.